



## ecology and environment, inc.

International Specialists in the Environment

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August 23, 2006

Mr. Calvin Terada, On-Scene Coordinator  
United States Environmental Protection Agency  
1200 Sixth Avenue, Mail Stop ECL-116  
Seattle, Washington 98101

**Re: Euclid Road Groundwater Site Hydrogeologic Evaluation**

Dear Mr. Terada:

Ecology and Environment, Inc. (E & E) is submitting to the United States Environmental Protection Agency this final letter report of a hydrogeologic evaluation for the Euclid Road Groundwater Site. The hydrogeologic evaluation included a review of available driller's logs for private supply wells located in the project area and evaluation of the elevations of water-bearing zones and water levels in the wells for which well logs were reviewed. In addition, available groundwater analytical data was reviewed to determine whether any spatial relations between the detected contaminants and detected contaminant concentrations could be identified.

**Evaluation Activities**

Driller's logs obtained from the Washington State Department of Ecology well log website (<http://www.ecy.wa.gov/programs/wr/wells/wellhome.html>) for 24 private supply wells from which groundwater analytical data are available were used for the evaluation. In addition, two springs and monitoring wells MW01 through MW04 installed in November 2005 (Emergency Sampling Report; Herrera 2006) were included in the evaluation. Elevations of water-bearing zones and water levels in the wells reported on the driller's logs were determined relative to land surface elevations obtained from United States Geological Survey topographic maps or from the Herrera 2006 report. Well construction details, water-bearing zone elevations, and water level elevations for the wells included in the evaluation are presented in Table 1.

Trichloroethene (TCE), *n*-Nitrosodimethylamine (NDMA), and perchlorate analytical results for groundwater samples collected by E & E from wells in the project area between October 2004 and November 2005 (Herrera 2006), and in March, April, May, and June 2006 were evaluated in an attempt to identify any spatial relationships between contaminant occurrences.

**Discussion**

Total depths of the potable wells used in the evaluation vary widely, ranging from 80 feet to 575 feet. Based on the reviewed driller's logs, potable wells in the project are generally constructed with relatively shallow casings (typically 20 to 40 feet) that are grouted in place (termed 'sealed' on the driller's logs). The wells are then drilled across multiple water-bearing zones and then completed either open hole, or with a smaller diameter inner casing (termed 'liner' on the driller's logs). Based on the reviewed driller's logs, a liner, when installed, is not sealed in the borehole

below the sealed casing and may or may not be perforated below the sealed casing. Because the liner is not sealed in the borehole, all water-bearing zones crossed by the borehole can yield water to the well through the bottom of the liner and through perforations in the liner, when present. Consequently, many of the wells appear to be open to multiple water zones. The water-bearing zones reported on the driller's logs occur at elevations that vary widely and do not appear to be correlatable across the project area.

Elevations of water levels reported on the driller's logs for the reviewed wells vary widely (range from 2,206 to 2,502 feet relative to mean sea level). Because many of these wells are open to multiple water-bearing zones that likely have different water levels, water levels in these wells likely represent an "average" water level that is not representative of any of the water-bearing zones tapped by the well. Consequently, these water levels likely do not represent water level elevations of any single, regionally extensive water-bearing zone and, therefore, do not appear to be usable for determining groundwater flow directions in the project area.

Based on the available analytical data, TCE groundwater contamination appears to be limited to a relatively small portion of the project area which consists of the southern and northern halves, respectively, of Sections 2 and 11, Township 25 North, Range 40 East. Within this area, TCE has been detected in four monitoring wells and six private supply wells at concentrations ranging from 0.24 to 210 micrograms per liter ( $\mu\text{g/l}$ ). Total depths of the monitoring wells range from 65.5 feet to 113.5 feet, and each well is screened across the uppermost water-bearing zone encountered at the well location based on well logs provided in Herrera (2006). These water bearing zones occur at depths ranging from 57 to 96 feet below ground surface which corresponds to elevations of 2,352 to 2,374 feet above mean sea level (see Table 1). Total depths of the private supply wells in which TCE has been detected range from 140 feet to 400 feet. Based on the reviewed well logs for private supply wells within this area, it is probable that the private supply wells in which TCE has been detected are completed across multiple water-bearing zones. Consequently, a potential exists that TCE groundwater contamination detected in these wells may reflect the presence of TCE contamination in multiple water-bearing zones within the area. The available analytical data do not appear sufficient to determine the extent of TCE contamination within this area.

NDMA and perchlorate have been detected in groundwater samples sporadically over the entire project area. Based on the available analytical data, NDMA detections are more limited than the perchlorate detections in groundwater. NDMA has been detected in 33 private supply wells in the project area at concentrations ranging from estimated concentrations of 0.0005 J to 0.0071 J  $\mu\text{g/l}$ . Perchlorate has been detected in 60 private supply wells and four monitoring wells in the project area. The detected perchlorate concentrations range from an estimated concentration of 0.0078 J to 3.2  $\mu\text{g/l}$ . The detected NDMA and perchlorate concentrations do not exhibit identifiable distribution trends across the project area.

Of the 28 wells listed in Table 1 for which analytical data is available, NDMA was detected in eight private supply wells, and perchlorate was detected in nine private supply wells and four monitoring wells. Both NDMA and perchlorate were detected in seven of the private supply wells. Total depths of the wells in which NDMA has been detected range from 80 to 280 feet. In contrast, the total depths of wells in which perchlorate has been detected range from 65.5 to 575 feet. In addition, the total depths of wells in which both NDMA and perchlorate have been detected range from 80 to 280 feet. The observed well depth ranges suggest perchlorate may be present in groundwater over a greater vertical extent than NDMA. It is unclear whether these

contaminant/well depth relationships reflect real or only apparent contaminant distributions in the project area, given that the set of wells in which these contaminant/well depth relationships were identified represent a limited subset all the wells in which NDMA and/or perchlorate have been detected in the project area.

In addition, it is unclear whether the occurrence of NDMA and perchlorate in groundwater at the site may be related to a common source for both contaminants. In contrast, the limited extent of detected TCE groundwater contamination in the project area suggests the TCE source is unrelated to the source(s) of NDMA and perchlorate.

### **Conclusions**

If further information regarding contaminant distributions and site hydrogeology is required, additional monitoring wells would need to be installed and sampled. The monitoring wells would need to be constructed to target specific water-bearing zones so that contaminant distributions can be identified within specific zones and hydraulic relationships within and between water-bearing zones can be established.

If you have any questions or comments regarding the hydrogeologic evaluation, please contact me at (850) 574-1400 or Mark Woodke at (206) 624-9537.

Sincerely,

ECOLOGY AND ENVIRONMENT, INC.

A handwritten signature in dark ink, appearing to read "Dan W. Foss". The signature is fluid and cursive, with the first name "Dan" being the most prominent.

Dan W. Foss  
Hydrogeologist

cc: M. Woodke; E & E - Seattle  
D. Shivjani; E & E - Seattle